Performance Evaluation of NAA Irradiation Holes in Hybrid-Low Power Research Reactor (H-LPRR)

Kyung-O Kim, Gyuhong Roh, and Byungchul Lee

Research Reactor Design Division, Korea Atomic Energy Research Institute, Daejeon, Republic of Korea
*E-mail: k5kim@kaeri.re.kr

Korea Atomic Energy Research Institute (KAERI) has designed the Hybrid-Low Power Research Reactor (H-LPRR) which can be used as a critical assembly and conventional research reactor as well. It is an open tank-in-pool type, of 50 kW thermal power (see Figure 1), and the Neutron Activiation Analysis (NAA) is one of the most important applications of H-LPRR. For this, there are eight irradiation holes on the edge of the core, classified into two types: IR (6 holes for RI production) and NA (2 holes for NAA) holes. In order to quantify elemental contents in analytical samples by Instrumental Neutron Actiation Analysis (INAA) with k_0-standarization method, it is necessary to measure neutron spectrum parameters such as thermal neutron flux, the deviation of the ideal 1/E epithermal neutron flux distribution defined as a $(1/E)^{1+\alpha}$ Shape (α), and themral-to-epithermal neutron flux ratio (f) for the irradiation holes. In this study, MCNP6 code and MATLAB are used to determine neutron spectrum parameters for the elemental analysis using INAA at two irradiation holes in H-LPRR, and α and f parameters are compared with ones of other research reactors. As a result, it is confirmed that α and f parameters of H-LPRR are 0.107 and 22.1, respectively, and these values are similar with ones of Vietnam (500 kW) & Malaysia (1 MW) TRIGA MARK II and Belgium Thetis (150 kW).
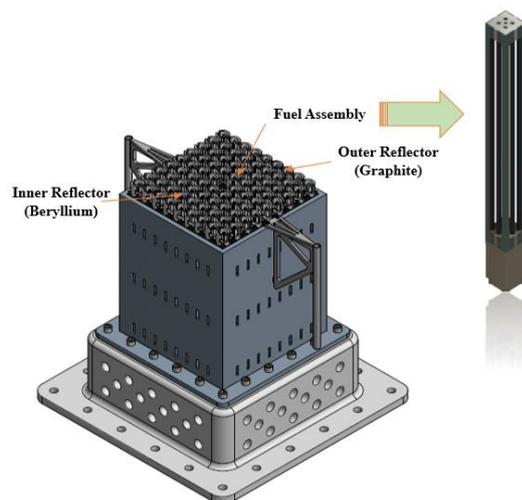

Fig. 1. Conceptual Design of H-LPRR